

TENT COOPERATION TREATY

PCT

NOTIFICATION OF ELECTION

(PCT Rule 61.2)

From the INTERNATIONAL BUREAU

To:

Commissioner
 US Department of Commerce
 United States Patent and Trademark
 Office, PCT
 2011 South Clark Place Room
 CP2/5C24
 Arlington, VA 22202
 ETATS-UNIS D'AMERIQUE

in its capacity as elected Office

| | |
|---|---|
| Date of mailing (day/month/year) 29 January 2001 (29.01.01) | |
| International application No. PCT/GB00/01937 | Applicant's or agent's file reference GPS/BP5854377 |
| International filing date (day/month/year) 19 May 2000 (19.05.00) | Priority date (day/month/year) 20 May 1999 (20.05.99) |
| Applicant HOFMANN, Martin, John | |

1. The designated Office is hereby notified of its election made:



in the demand filed with the International Preliminary Examining Authority on:

18 December 2000 (18.12.00)



in a notice effecting later election filed with the International Bureau on:

2. The election



was



was not

made before the expiration of 19 months from the priority date or, where Rule 32 applies, within the time limit under Rule 32.2(b).

| | |
|---|---|
| The International Bureau of WIPO 34, chemin des Colombettes 1211 Geneva 20, Switzerland Facsimile No.: (41-22) 740.14.35 | Authorized officer Pascal Piriou Telephone No.: (41-22) 338.83.38 |
|---|---|

COPY

PCT

REQUEST

The undersigned requests that the present international application be processed according to the Patent Cooperation Treaty

For receiving Office use only

International Application No.

International Filing Date

Name of receiving Office and "PCT International Application"

Applicant's or agent's file reference
(if desired) (12 characters maximum)

GPS/BP5854377

Box No. I TITLE OF INVENTION CHROMATOGRAPHY COLUMNS

Box No. II APPLICANT

Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (that is, country) of residence if no State of residence is indicated below.)

DOWNSTREAM MEDIA LIMITED
Unit 4
Brimscombe Port Business Park
Brimscombe Hill
Brimscombe
Stroud
Gloucestershire, GL5 2QN
GB

☐ This person is also inventor.

Telephone No.

Facsimile No.

Teleprinter No.

State (that is, country) of nationality: GB

State (that is, country) of residence: GB

This person is applicant for the purposes of:

☐

all designated States

☒

all designated States except the United States of America

☐

the United States of America only

☐

the States indicated in the Supplemental Box

Box No. III FURTHER APPLICANT(S) AND/OR (FURTHER) INVENTOR(S)

Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (that is, country) of residence if no State of residence is indicated below.)

HOFMANN MARTIN JOHN
9 Whitehall
Stroud
Gloucestershire
GL5 1HA
GB

This person is:

☐ applicant only☒ applicant and inventor☐ inventor only (if this check-box is marked, do not fill in below.)

State (that is, country) of nationality: GB

State (that is, country) of residence: GB

This person is applicant for the purposes of:

☐

all designated States

☐

all designated States except the United States of America

☒

the United States of America only

☐

the States indicated in the Supplemental Box

☐ Further applicants and/or (further) inventors are indicated on a continuation sheet.

Box No. IV AGENT OR COMMON REPRESENTATIVE; OR ADDRESS FOR CORRESPONDENCE

The person identified below is hereby/has been appointed to act on behalf of the applicant(s) before the competent International Authorities as:

☒

agent

☐

common representative

Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country.)

STONER, G. PATRICK and others
MEWBURN ELLIS
YORK HOUSE
23 KINGSWAY
LONDON WC2B 6HP
GB

Telephone No. 0117 9266411

Facsimile No. +44 20 7240 9339

Teleprinter No.

☐ Mark this check-box where no agent or common representative is/has been appointed and the space above is used instead to indicate a special address to which correspondence should be sent.

Box No. V DESIGNATION STATES

The following designations are hereby made under Rule 4.9(a) (mark the applicable check-boxes; at least one must be marked):

Regional Patent

- ☒ **AP** **ARIPO Patent:** GH Ghana, GM Gambia, KE Kenya, LS Lesotho, MW Malawi, SD Sudan, SL Sierra Leone, SZ Swaziland, UG Uganda, ZW Zimbabwe, and any other State which is a Contracting State of the Harare Protocol and of the PCT
- ☒ **EA** **Eurasian Patent:** AM Armenia, AZ Azerbaijan, BY Belarus, KG Kyrgyzstan, KZ Kazakhstan, MD Republic of Moldova, RU Russian Federation, TJ Tajikistan, TM Turkmenistan, and any other State which is a Contracting State of the Eurasian Patent Convention and of the PCT
- ☒ **EP** **European Patent:** AT Austria, BE Belgium, CH and LI Switzerland and Liechtenstein, CY Cyprus, DE Germany, DK Denmark, ES Spain, FI Finland, FR France, GB United Kingdom, GR Greece, IE Ireland, IT Italy, LU Luxembourg, MC Monaco, NL Netherlands, PT Portugal, SE Sweden, and any other State which is a Contracting State of the European Patent Convention and of the PCT
- ☒ **OA** **OAPI Patent:** BF Burkina Faso, BJ Benin, CF Central African Republic, CG Congo, CI Côte d'Ivoire, CM Cameroon, GA Gabon, GN Guinea, GW Guinea-Bissau, ML Mali, MR Mauritania, NE Niger, SN Senegal, TD Chad, TG Togo, and any other State which is a member State of OAPI and a Contracting State of the PCT (if other kind of protection or treatment desired, specify on dotted line)

National Patent (if other kind of protection desired, specify on dotted line):

- | | |
|--|--|
| <input checked="" type="checkbox"/> AE United Arab Emirates | <input checked="" type="checkbox"/> LT Lithuania |
| <input checked="" type="checkbox"/> AL Albania | <input checked="" type="checkbox"/> LU Luxembourg |
| <input checked="" type="checkbox"/> AM Armenia | <input checked="" type="checkbox"/> LV Latvia |
| <input checked="" type="checkbox"/> AT Austria | <input checked="" type="checkbox"/> MA Morocco |
| <input checked="" type="checkbox"/> AU Australia | <input checked="" type="checkbox"/> MD Republic of Moldova |
| <input checked="" type="checkbox"/> AZ Azerbaijan | <input checked="" type="checkbox"/> MG Madagascar |
| <input checked="" type="checkbox"/> BA Bosnia & Herzegovina | <input checked="" type="checkbox"/> MK The former Yugoslav Republic of Macedonia |
| <input checked="" type="checkbox"/> BB Barbados | |
| <input checked="" type="checkbox"/> BG Bulgaria | <input checked="" type="checkbox"/> MN Mongolia |
| <input checked="" type="checkbox"/> BR Brazil | <input checked="" type="checkbox"/> MW Malawi |
| <input checked="" type="checkbox"/> BY Belarus | <input checked="" type="checkbox"/> MX Mexico |
| <input checked="" type="checkbox"/> CA Canada | <input checked="" type="checkbox"/> NO Norway |
| <input checked="" type="checkbox"/> CH and LI Switzerland and Liechtenstein | <input checked="" type="checkbox"/> NZ New Zealand |
| <input checked="" type="checkbox"/> CN China | <input checked="" type="checkbox"/> PL Poland |
| <input checked="" type="checkbox"/> CR Costa Rica | <input checked="" type="checkbox"/> PT Portugal |
| <input checked="" type="checkbox"/> CU Cuba | <input checked="" type="checkbox"/> RO Romania |
| <input checked="" type="checkbox"/> CZ Czech Republic | <input checked="" type="checkbox"/> RU Russian Federation |
| <input checked="" type="checkbox"/> DE Germany | <input checked="" type="checkbox"/> SD Sudan |
| <input checked="" type="checkbox"/> DK Denmark | <input checked="" type="checkbox"/> SE Sweden |
| <input checked="" type="checkbox"/> DM Dominica | <input checked="" type="checkbox"/> SG Singapore |
| <input checked="" type="checkbox"/> EE Estonia | <input checked="" type="checkbox"/> SI Slovenia |
| <input checked="" type="checkbox"/> ES Spain | <input checked="" type="checkbox"/> SK Slovakia |
| <input checked="" type="checkbox"/> FI Finland | <input checked="" type="checkbox"/> SL Sierra Leone |
| <input checked="" type="checkbox"/> GB United Kingdom | <input checked="" type="checkbox"/> TJ Tajikistan |
| <input checked="" type="checkbox"/> GD Grenada | <input checked="" type="checkbox"/> TM Turkmenistan |
| <input checked="" type="checkbox"/> GE Georgia | <input checked="" type="checkbox"/> TR Turkey |
| <input checked="" type="checkbox"/> GH Ghana | <input checked="" type="checkbox"/> TT Trinidad and Tobago |
| <input checked="" type="checkbox"/> GM Gambia | <input checked="" type="checkbox"/> TZ Tanzania |
| <input checked="" type="checkbox"/> HR Croatia | <input checked="" type="checkbox"/> UA Ukraine |
| <input checked="" type="checkbox"/> HU Hungary | <input checked="" type="checkbox"/> UG Uganda |
| <input checked="" type="checkbox"/> ID Indonesia | <input checked="" type="checkbox"/> US United States of America |
| <input checked="" type="checkbox"/> IL Israel | |
| <input checked="" type="checkbox"/> IN India | <input checked="" type="checkbox"/> UZ Uzbekistan |
| <input checked="" type="checkbox"/> IS Iceland | <input checked="" type="checkbox"/> VN Viet Nam |
| <input checked="" type="checkbox"/> JP Japan | <input checked="" type="checkbox"/> YU Yugoslavia |
| <input checked="" type="checkbox"/> KE Kenya | <input checked="" type="checkbox"/> ZA South Africa |
| <input checked="" type="checkbox"/> KG Kyrgyzstan | <input checked="" type="checkbox"/> ZW Zimbabwe |
| <input checked="" type="checkbox"/> KP Democratic People's Republic of Korea | |
| <input checked="" type="checkbox"/> KR Republic of Korea | |
| <input checked="" type="checkbox"/> KZ Kazakhstan | |
| <input checked="" type="checkbox"/> LC St Lucia | |
| <input checked="" type="checkbox"/> LK Sri Lanka | |
| <input checked="" type="checkbox"/> LR Liberia | |
| <input checked="" type="checkbox"/> LS Lesotho | |

Check-boxes reserved for designating States which have become party to the PCT after issuance of this sheet:

- ☒ DZ Algeria
- ☒ AG Antigua and Barbuda
- ☒ MZ Mozambique
- ☒ Any other state which is party to the PCT

Precautionary Designation Statement: In addition to the designations made above, the applicant also makes under Rule 4.9(b) all designations which would be permitted under the PCT except any designation(s) indicated in the Supplemental Box as being excluded from the scope of this statement. The applicant declares that those additional designations are subject to confirmation and that any designation which is not confirmed before the expiration of 15 months from the priority date is to be regarded as withdrawn by the applicant at the expiration of that time limit. (Confirmation of a designation consists of the filing of a notice specifying that designation and the payment of the designation and confirmation fees. Confirmation must reach the receiving Office within the 15-month time limit.)

Supplemental Box

If the Supplemental Box is not used, this sheet need not be included in the request.

Use this box in the following cases:

1. If, in any of the Boxes, the space is insufficient to furnish all the information:

in particular:

- (i) *if more than two persons are involved as applicants and/or inventors and no "continuation sheet" is available;*
- (ii) *if, in Box No. II or in any of the sub-boxes of Box No. III, the indication "the States indicated in the Supplemental Box" is checked;*
- (iii) *if, in Box No. II or in any of the sub-boxes of Box No. III, the inventor or the inventor/applicant is not inventor for the purposes of all designated States or for the purposes of the United States of America;*
- (iv) *if, in addition to the agent(s) indicated in Box No. IV, there are further agents;*
- (v) *if, in Box No. V, the name of any State (or OAPI) is accompanied by the indication "patent of addition," or "certificate of addition," or if, in Box No. V, the name of the United States of America is accompanied by an indication "Continuation" or "Continuation-in-part";*
- (vi) *if, in Box No. VI, there are more than three earlier applications whose priority is claimed;*
- (vii) *if, in Box No. VI, the earlier application is an ARIPO application.*

2. If, with regard to the precautionary designation statement contained in Box No. V, the applicant wishes to exclude any State(s) from the scope of that statement:

3. If the applicant claims, in respect of any designated Office, the benefits of provisions of the national law concerning non-prejudicial disclosures or exceptions to lack of novelty:

In such case, write "Continuation of Box No. ..." (indicate the number of the Box) and furnish the information in the same manner as required according to the captions of the Box in which the space was insufficient;

in such case, write "Continuation of Box III" and indicate for each additional person the same type of information as required in Box No. III. The country of the address indicated in this box is the applicant's state (that is, country) of residence if no state of residence is indicated below;

in such case, write "Continuation of Box No. II" or "Continuation of Box No. III" or "Continuation of Boxes No. II and No. III" (as the case may be), indicate the name of the applicant(s) involved and next to (each) such name, the State(s) (and/or, where applicable, ARIPO, Eurasian, European or OAPI patent) for the purposes of which the named person is applicant;

in such case, write "Continuation of Box No. II" or "Continuation of Box No. III" or "Continuation of Boxes No. II and No. III" (as the case may be), indicate the name of the inventor(s) and, next to (each) such name, the State(s) (and/or, where applicable, ARIPO, Eurasian, European or OAPI patent) for the purposes of which the named person is inventor;

in such case, write "Continuation of Box No. IV" and indicate for each further agent the same type of information as required in Box No. IV;

in such case, write "Continuation of Box No. V" and the name of each State involved (or OAPI), and after the name of each such State (or OAPI), the number of the parent title or parent application and the date of grant of the parent title or filing of the parent application;

in such case, write "Continuation of Box No. VI" and indicate for each additional earlier application the same type of information as required in Box No. VI.

in such case, write "Continuation of Box No. VI", specify the number of the item corresponding to that earlier application and indicate at least one country party to the Paris Convention for the Protection of Industrial Property for which that earlier application was filed.

in such case, write "Designation(s) excluded from precautionary designation statement" and indicate the name or two-letter code of each state so excluded.

in such case, write "Statement Concerning Non-Prejudicial Disclosures or Exceptions to Lack of Novelty" and furnish that statement below.

Continuation of Box IV

| | |
|-----------------------|-----------------------|
| ARMITAGE, IAN M. | PAGET, HUGH C.E. |
| BRASNETT, ADRIAN H. | SANDERSON, MICHAEL J. |
| CALDERBANK, T. ROGER | STONER, G. PATRICK |
| CARTER, STEPHEN | STUART, IAN |
| COLEIRO, RAYMOND | WALTON, SEÁN M. |
| CRIPPS, JOANNA E. | WATSON, ROBERT J. |
| FORD, MICHAEL F. | |
| HACKNEY, NIGEL J. | |
| HARRISON, DAVID C. | |
| KIDDLE, SIMON J. | |
| KREMER, SIMON M. | |
| LYONS, JUNE, M. | |
| NICHOLLS, KATHRYN M. | |
| PAGET, HUGH C.E. | |
| SANDERSON, MICHAEL J. | |
| STONER, G. PATRICK | |

Continuation of Box No. ?

| | | | | | |
|--|-------------------------------|----------------------------------|--|---|--|
| Box No. VI | | PRIORITY CLAIM | | <input type="checkbox"/> Full priority claims are indicated in the Supplemental Box | |
| Filing date of earlier application (day/month/year) | Number of earlier application | Where earlier application is: | | | |
| | | national application: country | regional application: * regional Office | international application: receiving Office | |
| item (1) 20 May 1999 | 9911797.0 | GB | | | |
| item (2) | | | | | |
| item (3) | | | | | |

☐ The receiving Office is requested to prepare and transmit to the International Bureau a certified copy of the earlier application(s) (only if the earlier application was filed with the Office which for the purposes of the present international application is the receiving Office) identified above as item(s): _____

* Where the earlier application is an ARIPO application, it is mandatory to indicate in the supplemental box at least one country party to the Paris Convention for the Protection of Industrial Property for which that earlier application was filed (Rule 4.10(b)(ii)). See Supplemental Box.

Box No. VII INTERNATIONAL SEARCHING AUTHORITY

Choice of International Searching Authority (ISA)
(If two or more International Searching Authorities are competent to carry out the international search, indicate the Authority chosen; the two-letter code may be used):

ISA /

Request to use results of earlier search; reference to that search (if an earlier search has been carried out by or requested from the International Searching Authority):

Date (day/month/year) Number Country (or regional Office)

Box No. VIII CHECK LIST; LANGUAGE OF FILING

This international application contains the following number of sheets

| | |
|---|------------|
| request | :4 |
| description (excluding sequence listing part) | :11 |
| claims | :2 |
| abstract | :1 |
| drawings | :2 |
| sequence listing part of description | :0 |
| Total number of sheets | :20 |

This international application is accompanied by the item(s) marked below:

1. ☐ fee calculation sheet
2. ☐ separate signed power of attorney
3. ☒ copy of general power of attorney; reference number, if any:
4. ☐ statement explaining lack of signature
5. ☐ priority document(s) identified in Box No. VI as item(s):
6. ☐ translation of international application into (language):
7. ☐ separate indications concerning deposited microorganisms or other biological matter
8. ☐ nucleotide and/or amino acid sequence listing in computer readable form
9. ☐ other (specify):

Figure of the drawings which should accompany the abstract 1

Language of filing of the international application: ENGLISH

Box No. IX SIGNATURE OF APPLICANT OR AGENT

Next to each signature indicate the name of the person signing and the capacity in which the person signs (if such capacity is not obvious from reading the request).

STONER, G. PATRICK
APPOINTED AGENT

For receiving Office use only

| | |
|---|--|
| 1. Date of actual receipt of the purported international application: | 2. Drawings: <input type="checkbox"/> received: <input type="checkbox"/> not received: |
| 3. Corrected date of actual receipt due to later but timely received papers or drawings completing the purported international application: | |
| 4. Date of timely receipt of the required corrections under PCT Article 11(2): | |
| 5. International Searching Authority (if two or more are competent): ISA/ | |
| 6. <input type="checkbox"/> Transmittal of search copy delayed until search fee is paid | |

For International Bureau use only

Date of receipt of the record copy by the International Bureau:

PATENT COOPERATION TREATY

COPY

From the
INTERNATIONAL PRELIMINARY EXAMINING AUTHORITY

PCT

To:

STONER, Patrick G. and others
MEWBURN ELLIS
York House
23 Kingsway
London WC2B 6HP
GRANDE BRETAGNE

RECEIVED

- 6 SEP 2001

NOTIFICATION OF TRANSMITTAL OF
THE INTERNATIONAL PRELIMINARY
EXAMINATION REPORT
(PCT Rule 71.1)

Date of mailing
(day/month/year) 04.09.2001

Applicant's or agent's file reference

GPS/BP5854377

IMPORTANT NOTIFICATION

International application No.
PCT/GB00/01937

International filing date (day/month/year)
19/05/2000

Priority date (day/month/year)
20/05/1999

Applicant

DOWNSTREAM MEDIA LIMITED et al.

1. The applicant is hereby notified that this International Preliminary Examining Authority transmits herewith the international preliminary examination report and its annexes, if any, established on the international application.
2. A copy of the report and its annexes, if any, is being transmitted to the International Bureau for communication to all the elected Offices.
3. Where required by any of the elected Offices, the International Bureau will prepare an English translation of the report (but not of any annexes) and will transmit such translation to those Offices.

4. REMINDER

The applicant must enter the national phase before each elected Office by performing certain acts (filing translations and paying national fees) within 30 months from the priority date (or later in some Offices) (Article 39(1)) (see also the reminder sent by the International Bureau with Form PCT/IB/301).

Where a translation of the international application must be furnished to an elected Office, that translation must contain a translation of any annexes to the international preliminary examination report. It is the applicant's responsibility to prepare and furnish such translation directly to each elected Office concerned.

For further details on the applicable time limits and requirements of the elected Offices, see Volume II of the PCT Applicant's Guide.

Name and mailing address of the IPEA/

 European Patent Office
D-80298 Munich
Tel. +49 89 2399 - 0 Tx: 523656 epmu d
Fax: +49 89 2399 - 4465

Authorized officer

Chouloulidou, C

Tel. +49 89 2399-2257



PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

| | | | |
|---|--|---|--|
| Applicant's or agent's file reference GPS/BP5854377 | | FOR FURTHER ACTION See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416) | |
| International application No. PCT/GB00/01937 | International filing date (day/month/year) 19/05/2000 | Priority date (day/month/year) 20/05/1999 | |
| International Patent Classification (IPC) or national classification and IPC G01N30/60 | | | |
| Applicant DOWNSTREAM MEDIA LIMITED et al. | | | |

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.


2. This REPORT consists of a total of 5 sheets, including this cover sheet.

- ☐ This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

These annexes consist of a total of sheets.

3. This report contains indications relating to the following items:

- I ☒ Basis of the report
- II ☐ Priority
- III ☐ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- IV ☐ Lack of unity of invention
- V ☒ Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- VI ☐ Certain documents cited
- VII ☒ Certain defects in the international application
- VIII ☒ Certain observations on the international application

| | |
|---|---|
| Date of submission of the demand 18/12/2000 | Date of completion of this report 04.09.2001 |
| Name and mailing address of the international preliminary examining authority:  European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Tx: 523656 epmu d Fax: +49 89 2399 - 4465 | Authorized officer Feldhoff, R Telephone No. +49 89 2399 2186 |



**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT**

International application No. PCT/GB00/01937

I. Basis of the report

1. With regard to the **elements** of the international application (*Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17)*):

Description, pages:

1-11 as originally filed

Claims, No.:

1-9 as originally filed

Drawings, sheets:

1/2-2/2 as originally filed

2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

These elements were available or furnished to this Authority in the following language: , which is:

- ☐ the language of a translation furnished for the purposes of the international search (under Rule 23.1(b)).
☐ the language of publication of the international application (under Rule 48.3(b)).
☐ the language of a translation furnished for the purposes of international preliminary examination (under Rule 55.2 and/or 55.3).

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

- ☐ contained in the international application in written form.
☐ filed together with the international application in computer readable form.
☐ furnished subsequently to this Authority in written form.
☐ furnished subsequently to this Authority in computer readable form.
☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. The amendments have resulted in the cancellation of:

- ☐ the description, pages:
☐ the claims, Nos.:

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No. PCT/GB00/01937

☐ the drawings, sheets:

5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)):

(Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.)

6. Additional observations, if necessary:

V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

| | | | |
|-------------------------------|------|--------|-----|
| Novelty (N) | Yes: | Claims | 2-9 |
| | No: | Claims | 1 |
| Inventive step (IS) | Yes: | Claims | |
| | No: | Claims | 2-9 |
| Industrial applicability (IA) | Yes: | Claims | 1-9 |
| | No: | Claims | |

2. Citations and explanations
see separate sheet

VII. Certain defects in the international application

The following defects in the form or contents of the international application have been noted:
see separate sheet

VIII. Certain observations on the international application

The following observations on the clarity of the claims, description, and drawings or on the question whether the claims are fully supported by the description, are made:
see separate sheet

**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT - SEPARATE SHEET**

International application No. PCT/GB00/01937

Re Item V

Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

Prior Art Documents

The following documents (D) cited in the search report are referred to in this communication:

D1: JP-A-03 197 863

D2: EP-A-0 476 997

D3: US-A-4 289 620

D4: US-A-4 510 058

Lack of Novelty of independent claim 1; Article 33(2) PCT

Document D1 discloses the features of claim 1 (see e. g. abstract and figure).

Document D2 discloses the features of claim 1 (see e. g. col. 2, l. 30-40; col. 3, lines 32-36 and figures 1, 2).

Document D3 discloses the features of claim 1 (see e. g. abstract; col. 2, line 66 - col. 3, line 20 and figures 2, 3).

Document D4 discloses the features of claim 1 (see e. g. abstract; col. 6, line 36 - 47 and figure 1a).

Therefore, the subject-matter of claim 1 is not new.

Lack of Inventive Step of dependent claims 2-9; Article 33(3) PCT

These dependent claims do not appear to contain any additional features which, in combination with the features of any claim to which they refer, meet the requirements of inventive step in the sense of Article 33(3) and Rule 65 PCT, the reasons being as follows:

Claim 2: see e. g. **D2**, col. 3, l. 54 - col. 4, l. 14 and claims 1, 2.

Claim 3: see e. g. **D2**, col. 3, l. 54 - col. 4, l. 14; **D3**, col. 3, l. 4-7 and 17-20.

Claim 4: see e. g. **D1**, figure (3); **D2**, fig. 1; **D3**, fig. 2 (104); **D4**, fig. 1a (5).

Claim 5: see e. g. **D2**, fig. 1 and col. 2, l. 30-34.

Claim 6: see e. g. **D2**, fig. 1 (20).

**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT - SEPARATE SHEET**

International application No. PCT/GB00/01937

Claim 7: see e. g. **D1**, fig.; **D2**, fig. 1; **D4**, fig. 1a.

Claim 8: this claim seems to refer to a hollow plunger, which is regarded as a simple constructional design feature.

Claim 9: see e. g. **D2**, fig. 1 (12).

Re Item VII

Certain defects in the international application

Independent claim 1 is not in the two-part form, which in the present case would be appropriate, with those features known in combination from the prior art (e. g. D2) being placed in the preamble and with the remaining features being included in the characterising part; Rule 6.3 b) PCT and PCT Guidelines III-2.2 and 2.3.

The above-mentioned prior art document (D2) is not cited and discussed in the description as required by Rule 5.1 a) ii) PCT.

The claims do not contain reference signs in parentheses; Rule 6.2 b) PCT.

Re Item VIII

Certain observations on the international application

Lack of Clarity; Article 6 PCT

The application does not meet the requirements of Article 6 PCT because of the following clarity objections:

Claim 1, line 4: "end filter arrangement"; unclear.

Claim 1, line 6: "between them"; between what?

Claim 5: is the joint boundary on the external surface of the plunger? Is the end surface part of this external surface?

Claim 6: it can not be understood what a "one-piece integral instruction" is or what its purpose or advantage should be.

Claim 7: this expression does not seem to describe any of the embodiments of figures 2-5. Does the outer wall include the end surface?

Claim 8: does this claim refer to a hollow plunger?

PATENT COOPERATION TREATY

COPY

PCT

From the RECEIVING OFFICE

To:

Mewburn Ellis

Ye House

23 Kingsway

London

WC2B 6HP

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05 JUN 2000

NOTIFICATION OF THE INTERNATIONAL
APPLICATION NUMBER AND OF THE
INTERNATIONAL FILING DATE

(PCT Rule 20.5(c))

Date of mailing
(day/month/year)

01 JUN 2000

Applicant's or agents's file reference

GPS/BP5854377

IMPORTANT NOTIFICATION

International application No.

PCT/GB00/01937

International filing date (day/month/year)

19/05/2000

Priority date (day/month/year)

20/05/1999

Applicant

Downstream Media Limited et al

Title of the invention

Chromatography Columns

1. The applicant is hereby notified that the international application has been accorded the international application number and the international filing date indicated above.

2. The applicant is further notified that the record copy of the international application:



was transmitted to the International Bureau on

01 JUN 2000



has not yet been transmitted to the International Bureau for the reason indicated below and a copy of this notification has been sent to the International Bureau*:



because the necessary national security clearance has not yet been obtained.



because (reason to be specified):

* The International Bureau monitors the transmittal of the record copy by the receiving Office and will notify the applicant (with Form PCT/IB/301) of its receipt. Should the record copy not have been received by the expiration of 14 months from the priority date, the International Bureau will notify the applicant (Rule 22.1(c)).

Name and mailing address of the receiving Office

The Patent Office
Cardiff Road, Newport
South Wales NP9 1RH

Authorized officer

Tracey Hiscox

Facsimile No.

Telephone No. 01633 814589

COPY

TENT COOPERATION TREATY

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From the INTERNATIONAL BUREAU

NOTIFICATION OF RECEIPT OF
RECORD COPY

(PCT Rule 24.2(a))

To:

STONER, G., Patrick
Mewburn Ellis
York House
23 Kingsway
London WC2B 6HP
ROYAUME-UNI

RECEIVED

17 JUL 2000

| | |
|---|---|
| Date of mailing (day/month/year) 05 July 2000 (05.07.00) | IMPORTANT NOTIFICATION |
| Applicant's or agent's file reference GPS/BF5854377 | International application No. PCT/GB00/01937 |

The applicant is hereby notified that the International Bureau has received the record copy of the international application as detailed below.

Name(s) of the applicant(s) and State(s) for which they are applicants:

DOWNSTREAM MEDIA LIMITED (for all designated States except US)
HOFMANN, Martin, John (for US)

International filing date 19 May 2000 (19.05.00)
Priority date(s) claimed 20 May 1999 (20.05.99)

Date of receipt of the record copy by the International Bureau : 22 June 2000 (22.06.00)

List of designated Offices :

AP : GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZW
EA : AM, AZ, BY, KG, KZ, MD, RU, TJ, TM
EP : AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE
OA : BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG
National : AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CR, CU, CZ, DE, DK, DM, DZ, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZW


ATTENTION

The applicant should carefully check the data appearing in this Notification. In case of any discrepancy between these data and the indications in the international application, the applicant should immediately inform the International Bureau.

In addition, the applicant's attention is drawn to the information contained in the Annex, relating to:

- ☒ time limits for entry into the national phase
☐ confirmation of precautionary designations
☒ requirements regarding priority documents

A copy of this Notification is being sent to the receiving Office and to the International Searching Authority.

| | |
|---|---|
| The International Bureau of WIPO 34, chemin des Colombettes 1211 Geneva 20, Switzerland | Authorized officer:  Mougamadou ABIDINE |
| Facsimile No. (41-22) 740.14.35 | Telephone No. (41-22) 338.83.38 |

COPY

PATENT COOPERATION TREATY

PCT

NOTIFICATION CONCERNING
SUBMISSION OR TRANSMITTAL
OF PRIORITY DOCUMENT

(PCT Administrative Instructions, Section 411)

From the INTERNATIONAL BUREAU

To:

STONER, G., Patrick
Mewburn Ellis
York House
23 Kingsway
London WC2B 6HP
ROYAUME-UNI

RECEIVED

3 - NOV 2000

| | |
|--|--|
| Date of mailing (day/month/year) 27 October 2000 (27.10.00) | |
| Applicant's or agent's file reference GPS/BP5854377 | IMPORTANT NOTIFICATION |
| International application No. PCT/GB00/01937 | International filing date (day/month/year) 19 May 2000 (19.05.00) |
| International publication date (day/month/year) Not yet published | Priority date (day/month/year) 20 May 1999 (20.05.99) |
| Applicant DOWNSTREAM MEDIA LIMITED et al | |

1. The applicant is hereby notified of the date of receipt (except where the letters "NR" appear in the right-hand column) by the International Bureau of the priority document(s) relating to the earlier application(s) indicated below. Unless otherwise indicated by an asterisk appearing next to a date of receipt, or by the letters "NR", in the right-hand column, the priority document concerned was submitted or transmitted to the International Bureau in compliance with Rule 17.1(a) or (b).
2. This updates and replaces any previously issued notification concerning submission or transmittal of priority documents.
3. An asterisk(*) appearing next to a date of receipt, in the right-hand column, denotes a priority document submitted or transmitted to the International Bureau but not in compliance with Rule 17.1(a) or (b). In such a case, **the attention of the applicant is directed** to Rule 17.1(c) which provides that no designated Office may disregard the priority claim concerned before giving the applicant an opportunity, upon entry into the national phase, to furnish the priority document within a time limit which is reasonable under the circumstances.
4. The letters "NR" appearing in the right-hand column denote a priority document which was not received by the International Bureau or which the applicant did not request the receiving Office to prepare and transmit to the International Bureau, as provided by Rule 17.1(a) or (b), respectively. In such a case, **the attention of the applicant is directed** to Rule 17.1(c) which provides that no designated Office may disregard the priority claim concerned before giving the applicant an opportunity, upon entry into the national phase, to furnish the priority document within a time limit which is reasonable under the circumstances.

| <u>Priority date</u> | <u>Priority application No.</u> | <u>Country or regional Office or PCT receiving Office</u> | <u>Date of receipt of priority document</u> |
|------------------------|---------------------------------|---|---|
| 20 May 1999 (20.05.99) | 9911797.0 | GB | 06 Octo 2000 (06.10.00) |

The International Bureau of WIPO
34, chemin des Colombettes
1211 Geneva 20, Switzerland

Facsimile No. (41-22) 740.14.35

Authorized officer

J. Leitao

Telephone No. (41-22) 338.83.38

COPY PATENT COOPERATION TREATY

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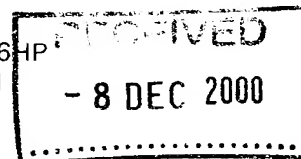
NOTICE INFORMING THE APPLICANT OF THE COMMUNICATION OF THE INTERNATIONAL APPLICATION TO THE DESIGNATED OFFICES

(PCT Rule 47.1(c), first sentence)

From the INTERNATIONAL BUREAU

To:

STONER, G., Patrick
Mewburn Ellis
York House
23 Kingsway
London WC2B 6HP
ROYAUME-UNI



| | | |
|---|--|--|
| Date of mailing (day/month/year) 30 November 2000 (30.11.00) | | |
| Applicant's or agent's file reference GPS/BP5854377 | | IMPORTANT NOTICE |
| International application No. PCT/GB00/01937 | International filing date (day/month/year) 19 May 2000 (19.05.00) | |
| | | Priority date (day/month/year) 20 May 1999 (20.05.99) |
| Applicant DOWNSTREAM MEDIA LIMITED et al | | |

1. Notice is hereby given that the International Bureau has communicated, as provided in Article 20, the international application to the following designated Offices on the date indicated above as the date of mailing of this Notice:
AG,AU,DZ,KP,KR,MZ,US

In accordance with Rule 47.1(c), third sentence, those Offices will accept the present Notice as conclusive evidence that the communication of the international application has duly taken place on the date of mailing indicated above and no copy of the international application is required to be furnished by the applicant to the designated Office(s).

2. The following designated Offices have waived the requirement for such a communication at this time:

AE,AL,AM,AP,AT,AZ,BA,BB,BG,BR,BY,CA,CH,CN,CR,CU,CZ,DE,DK,DM,EA,EE,EP,ES,FI,GB,GD,GE,GH,GM,HR,HU,ID,IL,IN,IS,JP,KE,KG,KZ,LC,LK,LR,LS,LT,LU,LV,MA,MD,MG,MK,MN,MW,MX,NO,NZ,OA,PL,PT,RO,RU,SD,SE,SG,SI,SK,SL,TJ,TM,TR,TT,TZ,UA,UG,UZ,VN,YU,ZA,ZW

The communication will be made to those Offices only upon their request. Furthermore, those Offices do not require the applicant to furnish a copy of the international application (Rule 49.1(a-bis)).

3. Enclosed with this Notice is a copy of the international application as published by the International Bureau on 30 November 2000 (30.11.00) under No. WO 00/72002

REMINDER REGARDING CHAPTER II (Article 31(2)(a) and Rule 54.2)

If the applicant wishes to postpone entry into the national phase until 30 months (or later in some Offices) from the priority date, a demand for international preliminary examination must be filed with the competent International Preliminary Examining Authority before the expiration of 19 months from the priority date.

It is the applicant's sole responsibility to monitor the 19-month time limit.

Note that only an applicant who is a national or resident of a PCT Contracting State which is bound by Chapter II has the right to file a demand for international preliminary examination.

REMINDER REGARDING ENTRY INTO THE NATIONAL PHASE (Article 22 or 39(1))

If the applicant wishes to proceed with the international application in the national phase, he must, within 20 months or 30 months, or later in some Offices, perform the acts referred to therein before each designated or elected Office.

For further important information on the time limits and acts to be performed for entering the national phase, see the Annex to Form PCT/IB/301 (Notification of Receipt of Record Copy) and Volume II of the PCT Applicant's Guide.

| | |
|---|---------------------------------|
| The International Bureau of WIPO 34, chemin des Colombettes 1211 Geneva 20, Switzerland | Authorized officer J. Zahra |
| Facsimile No. (41-22) 740.14.35 | Telephone No. (41-22) 338.83.38 |

The demand must be filed directly with the competent International Preliminary Examining Authority or, if two or more Authorities are competent, with the one chosen by the applicant. The full name or two-letter code of that Authority may be indicated by the applicant on the line below:

IPEA

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DEMAND

CHAPTER II

under Article 31 of the Patent Cooperation Treaty:
The undersigned requests that the international application specified below be the subject of
international preliminary examination according to the Patent Cooperation Treaty and
hereby elect all eligible States (except where otherwise indicated).

For International Preliminary Examining Authority use only

| | |
|------------------------|---------------------------|
| Identification of IPEA | Date of receipt of DEMAND |
|------------------------|---------------------------|

| | | |
|--|---|---|
| Box No. I IDENTIFICATION OF THE INTERNATIONAL APPLICATION | | Applicant's or agent's file reference GPS/BP5854377 |
| International application No. PCT/GB00/01937 | International filing date (day/month/year) 19 May 2000 | (Earliest Priority date (day/month/year) 20 May 1999 |

Title of invention Chromatography Columns

| | |
|--|--|
| Box No. II APPLICANT(S) | |
| Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country.) DOWNSTREAM MEDIA LIMITED Unit 4, Brimscombe Port Business Park Brimscombe Hill Brimscombe Stroud Gloucestershire, GL5 2QN | Telephone No.: Facsimile No.: Teleprinter No.: |
| State (i.e. country) of nationality: GB | State (i.e. country) of residence: GB |

Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country.)

HOFMANN MARTIN JOHN
9 Whitehall
Stroud
Gloucestershire
GL5 1HA
GB

| | |
|--|--|
| State (i.e. country) of nationality: GB | State (i.e. country) of residence: GB |
|--|--|

Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country.)

| | |
|--------------------------------------|------------------------------------|
| State (i.e. country) of nationality: | State (i.e. country) of residence: |
|--------------------------------------|------------------------------------|

☐ Further applicants are indicated on a continuation sheet

Box No. III AGENT OR COMMON REPRESENTATIVE; OR ADDRESS FOR CORRESPONDENCE

The following person is ☒ agent ☐ common representative
 and ☒ has been appointed earlier and represents the applicant(s) also for international preliminary examination
☐ is hereby appointed and any earlier appointment of (an) agent(s)/common representative is hereby revoked
☐ is hereby appointed, specifically for the procedure before the International Preliminary Examining Authority, in addition to the agent(s)/common representative appointed earlier

Name and address: *(Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country.)*

STONER, G PATRICK and others
 Mewburn Ellis
 York House
 23 Kingsway
 London WC2B 6HP
 GB

Telephone No.:
 0117 926 6411

Facsimile No.:
 020 7240 9339

Teleprinter No.:

☐ **Address for correspondence:** Mark this check-box where no agent or common representative is/has been appointed and the space above is used instead to indicate a special address to which correspondence should be sent.

Box No. IV BASIS FOR INTERNATIONAL PRELIMINARY EXAMINATION**Statement concerning amendments:***

1 The applicant wishes the international preliminary examination to start on the basis of:

☐ the international application as originally filed

the description ☐ as originally filed

☐ as amended under Article 34

the claims ☐ as originally filed

☐ as amended under Article 19 (together with any accompanying statement)

☐ as amended under Article 34

the drawings ☐ as originally filed

2. ☐ The applicant wishes any amendment to the claims under Article 19 to be considered as reversed.

3. ☐ The applicant wishes the start of the international preliminary examination to be postponed until the expiration of 20 months from the priority date unless the International Preliminary Examination Authority receives a copy of any amendments made under Article 19 or a notice from the applicant that he does not wish to make such amendments (Rule 69.1(d)). *(This check-box may be marked only where the time limit under Article 19 has not yet expired.)*

* Where no check-box is marked, international preliminary examination will start on the basis of the international application as originally filed, or where a copy of amendments to the claims under Article 19 and/or amendments of the international application under Article 34 are received by the International Preliminary Examining Authority before it has begun to draw up a written opinion or the international preliminary examination, as so amended.

Language for the purposes of international preliminary examination: ENGLISH

☐ which is the language in which the international application was filed

☐ which is the language of a translation furnished for the purposes of international search.

☐ which is the language of publication of the international application

☐ which is the language of the translation (to be) furnished for the purposes of international preliminary examination

Box No. V ELECTION OF STATES

The applicant hereby **elects all eligible States** (that is, all States which have been designated and which are bound by Chapter II of the PCT)

excluding the following States which the applicant wishes **not to elect**:

Box No. VI CHECK LIST

The demand is accompanied by the following elements, in the language referred to in Box No. IV, for the purposes of international preliminary examination

- | | |
|---|--------|
| 1. translation of international application : | sheets |
| 2. amendments under Article 34 : | sheets |
| 3. copy (or, where required, translation) of amendments under Article 19 : | sheets |
| 4. copy (or, when required, translation) of statement under Article 19 : | sheets |
| 5. letter : | sheets |
| 6. other (<i>specify</i>) : | sheets |

For International Preliminary
Examining Authority use only
received not received

| | |
|--------------------------|--------------------------|
| <input type="checkbox"/> | <input type="checkbox"/> |
| <input type="checkbox"/> | <input type="checkbox"/> |
| <input type="checkbox"/> | <input type="checkbox"/> |
| <input type="checkbox"/> | <input type="checkbox"/> |
| <input type="checkbox"/> | <input type="checkbox"/> |
| <input type="checkbox"/> | <input type="checkbox"/> |

The demand is also accompanied by the item(s) marked below:

- | | |
|---|--|
| 1. <input type="checkbox"/> fee calculation sheet | 4. <input type="checkbox"/> statement explaining lack of signature |
| 2. <input type="checkbox"/> separate signed power of attorney | 5. <input type="checkbox"/> nucleotide and or amino acid sequence listing in computer readable form |
| 3. <input type="checkbox"/> copy of general power of attorney; reference number, if any: | 6. <input type="checkbox"/> other (<i>specify</i>): |

Box No. VII SIGNATURE OF APPLICANT, AGENT OR COMMON REPRESENTATIVE

Next to each signature, indicate the name of the person signing and the capacity in which the person signs (if such capacity is not obvious from reading the demand).

.....
PATRICK STONER

APPOINTED AGENT

For International Preliminary Examining Authority use only

1. Date of actual receipt of DEMAND:

2. Adjusted date of receipt of demand due
to CORRECTIONS under Rule 60.1(b):

3. ☐ The date of receipt of the demand is AFTER the expiration of 19 months from
the priority date and item 4 or 5, below, does not apply.

☐ The applicant has been
informed accordingly.

4. ☐ The date of receipt of the demand is WITHIN the period of 19 months from the priority date as extended by virtue of Rule 80.5

5. ☐ Although the date of receipt of the demand is after the expiration of 19 months from the priority date, the delay in arrival is
EXCUSED pursuant to Rule 82.

For International Bureau use only

Demand received from IPEA on:

(19) World Intellectual Property Organization
International Bureau



(43) International Publication Date
30 November 2000 (30.11.2000)

PCT

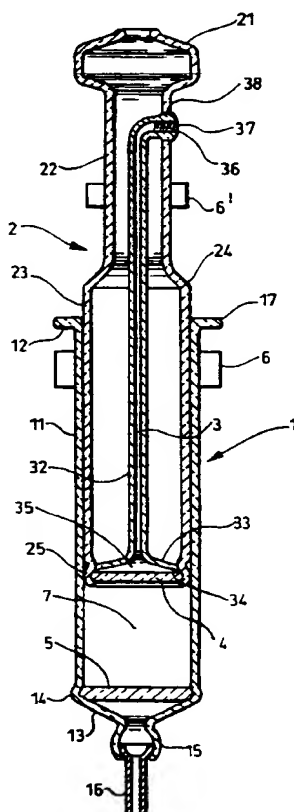
(10) International Publication Number
WO 00/72002 A1

- (51) International Patent Classification⁷: G01N 30/60
- (21) International Application Number: PCT/GB00/01937
- (22) International Filing Date: 19 May 2000 (19.05.2000)
- (25) Filing Language: English
- (26) Publication Language: English
- (30) Priority Data:
9911797.0 20 May 1999 (20.05.1999) GB
- (71) Applicant (for all designated States except US): DOWN-STREAM MEDIA LIMITED [GB/GB]; Unit 4, Brimscombe Port Business Park, Brimscombe Hill, Brimscombe, Stroud, Gloucestershire GL5 2QN (GB).
- (72) Inventor; and
(75) Inventor/Applicant (for US only): HOFMANN, Martin, John [GB/GB]; 9 Whitehall, Stroud, Gloucestershire GL5 1HA (GB).
- (74) Agents: STONER, G., Patrick et al.; Mewburn Ellis, York House, 23 Kingsway, London WC2B 6HP (GB).
- (81) Designated States (national): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CR, CU, CZ, DE, DK, DM, DZ, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZW.
- (84) Designated States (regional): ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European

[Continued on next page]

(54) Title: CHROMATOGRAPHY COLUMNS

(57) Abstract: A chromatography column suitable for small-scale laboratory use as a column tube (1) resembling that of a syringe and a movable plunger (2) which slides in the column tube. End filter arrangements (4, 5) are mounted by direct integration e.g. melt-bonding of glass, into these components. A tubular stem (3) providing an internal flow conduit to the end filter arrangement (4) at the front end of the plunger (2) is also integrally bonded behind the permeable filter portion. By making all of these operational components out of a formable, melt-bondable material, preferably glass which can also make sliding seals with itself, the resulting chromatography column is simple to use and unlikely to leak by comparison with conventional laboratory columns which use many discrete components.



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patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

Published:

-- *With international search report.*

- 1 -

CHROMATOGRAPHY COLUMNSFIELD OF THE INVENTION

This invention has to do with chromatography columns and in particular laboratory columns, i.e. small columns such as are used for bench scale or research work.

BACKGROUND OF THE INVENTION

Generally speaking a column of the relevant kind (referred to herein as being "of the kind described") has a column tube and end filter arrangements which, in use, retain a bed of particulate chromatography medium in the column tube between them while allowing the passage of fluid for chromatography. At least one of the end filter arrangements is at the front end of a plunger which is axially slidable along inside the tubular column, makes a seal outwardly against the column tube and incorporates an internal flow conduit communicating along the plunger between a filter portion of the filter arrangement and a rear part of the plunger outside the column tube.

PRIOR ART

Columns of the kind described are currently available at varying levels of cost and complexity.

The column tube is usually glass.

In sophisticated versions the plunger shaft has outer and inner stiff concentric plastic tubes. The inner tube may be a thick solid tube, with a narrow bore providing the flow conduit. Or it may be a wide-bored tube housing an inmost fine flexible tube which is the flow conduit. At the front end of this shaft a rubber sealing ring is trapped between end formations of the inner and outer stiff tubes, and the filter arrangement has a porous disc (e.g. a

- 2 -

sinter or mesh) clamped over a divergent flow distributing end surface of the inner tube, at the outlet of the flow conduit. The outer stiff tube runs slidably through a plastics end unit screwed onto the end of the column tube.

5 The end unit has a mechanism which may be switched between a free sliding engagement with the plunger's outer plastics tube (for large axial movements) and a screw-threaded engagement (for fine adjustments). An interned screw engagement is also provided between the inner and outer
10 tubes so that after advancing the plunger to the desired position - i.e. contacting the end of the bed of medium - the rubber sealing ring can be squeezed out into sealing contact with the column tube wall by axially compressing it between the end formations of the inner and outer tubes.

15 Internal plunger seals are also provided to prevent leakage from between the internal conduit and the filter element into the interior of the plunger construction, or to the outside of the shaft. These columns give good results but can be very expensive, and are complicated to use and
20 maintain.

Laboratory columns of another, simpler kind use short removable plugs at both ends of the column. The plugs are solid polymeric units having an outer O-ring seal to seal against the glass column wall, a narrow central bore for
25 the fluid flow and a flat annular recess at the inner face which receives the porous filter disc. The plug has a very short travel into the column tube, so the media bed must be carefully filled to the correct depth. The necessarily tight-fitting seal makes it hard work to push the plug into
30 the column end. The outside of the glass tube end is

- 3 -

threaded to take a clamping nut which holds the plug in once installed. These columns are simpler and cheaper than known plunger columns of the kind described, but less versatile.

5 SUMMARY OF THE INVENTION

 A first proposal herein is that the plunger of a column of the kind described comprises a tubular stem of glass or other formable material, preferably transparent, which defines in one piece the internal fluid flow conduit.
10 The permeable filter element is integrally bonded to the front end of this tubular stem across the internal fluid flow conduit.

 In particular the filter element is preferably bonded to the plunger stem by being integrally fused therewith,
15 e.g. by heat-fusing. The materials of the filter element and stem can be selected for compatibility in this respect, e.g. both may be of glass or a suitable thermoplastics material. A preferred version has a glass stem fused to a sintered glass filter element.

20 Preferably the tubular stem defining the internal fluid flow conduit extends as a one-piece integral whole rearwardly to a rear connection union at the rear of the plunger, i.e. a threaded union, spigot or ferrule. Preferably this union has a joint boundary which is
25 exterior of the plunger stem. Like the integral bonding of the filter element at the front end, this one-piece construction provides a simple means for preventing leakage within the plunger which is a significant difficulty with prior art constructions.

30 A further proposal, preferably combined with the

- 4 -

above, is that a one-piece integral construction joins the permeable filter element and an outwardly-directed sealing portion at or adjacent the front end of the plunger which makes a seal directly against the column tube wall, or which mounts a deformable seal element for making such a seal.

In particular the filter element is preferably bonded to the plunger's outer wall by being integrally fused therewith, e.g by heat-fusing. Again, use of glass or thermoplastics material for the filter element and plunger outer wall is advantageous in this respect; a sintered glass filter element may be fused to an outer glass wall of the plunger.

A further independent proposal herein, again preferably combined with the above, is that the plunger comprises a tubular stem of glass or other formable material which defines, preferably in one piece, the internal fluid flow conduit, and also an outer plunger wall spaced outwardly from the tubular stem, the outer plunger wall and tubular stem being integrally bonded to one another at the front end of the plunger so as to seal off the internal space of the plunger at the front end. Preferably one or both of the stem and plunger outer wall is/are integrally bonded to the filter element, as in the first and/or second aspects set out above. Again the use of fused glass or other thermoplastics is advantageous. Prevention of leakage to within the plunger structure can therefore be prevented reliably without additional internal sealing components. By combination with the other aspects above, the entire internal fluid flow path from a rear

- 5 -

connection union to the permeable filter element can be sealed *vis á vis* the plunger interior without requiring seal components between discrete mechanical parts. The use of glass or other suitable thermoplastics enables such a construction to be made easily e.g using conventional plastics-forming or glass-blowing techniques. Furthermore the use of a transparent material enables the user to observe the flow of material within the plunger.

An outwardly-directed sealing portion at or adjacent the front end of the plunger may have a plunger wall surface which is shaped e.g by machining or moulding, most preferably a machined glass surface, to fit and seal directly against the column tube wall. The use of ground glass surfaces to make fluid-tight seals is as such well-known in the laboratory context. The present proposal can exploit this in a new way, enabling a special advantage in combination with the other aspects as described above and the transparency available with glass material. Machined glass surfaces are not highly transparent but become so when in wetted contact with another glass surface. The plunger exterior may thus have a cylindrical sealing portion making a fitting seal against the column tube wall interior. This sealing portion may be axially elongate, so as to align the plunger axially in the column and avoid the need for column tube end units as were required in the prior art. The same advantage may be achieved by other plunger constructions providing an axially-elongate fitting engagement inside the column tube, e.g axially-extending fins or the like behind the sealing portion which may itself then be shorter.

- 6 -

The plunger may be made with a deformable e.g resilient sealing element such as a sealing ring, preferably an O-ring seal, fitting around the plunger's outer wall to make a sealing arrangement against the column tube wall.

The internal fluid flow conduit preferably has an elongate portion of relatively narrow cross section (e.g less than 1 or 2mm diameter) and a divergent (larger cross-section) distribution portion immediately adjacent to the permeable filter element. Where the internal tubular conduit is provided in a discrete tubular stem within an outer plunger wall, the tubular stem is preferably flared at its lower end to provide this divergence. Again this is easy to do with glass or thermoplastics tubular stems.

Particularly in smaller size columns, the plunger may be essentially a solid rod whose outer surface opposes the column wall, with a narrow central bore for the fluid flow conduit. In this case the front end of the rod may be shaped to form a divergent zone around the front opening of the flow bore.

The plunger can resemble that of a syringe. It may have a head at its rear (outward) end adapted for manual pushing. Preferably a rear connection union for the internal fluid flow conduit emerges transversely from the plunger, below such a head.

The column tube wall may be double-ended as in known constructions, and plungers as described above may be deployed at both ends. More preferably however we propose that one end of the column tube wall has a full-diameter opening receiving the mentioned plunger and the other end

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is a closed end, converging to a union for an external fluid flow conduit, with a fixed permeable filter element across the column tube adjacent the closed end. The fixed permeable element may be permanently installed, e.g a glass sinter disc fused into a glass column tube wall. Or, a mount may be provided for fixed mounting of an exchangeable filter element.

The volume of the column is typically not more than 100ml.

BRIEF DESCRIPTION OF THE DRAWINGS

Embodiments of the invention are described with reference to the accompanying drawings, in which

FIG 1 is an axial cross-sectional view of a laboratory chromatography column embodying the invention, and

FIGS 2-5 illustrate some possible variants of plunger construction.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

With reference to Fig 1, an all-glass laboratory chromatography column consists of a column tube 1 in which a plunger 2 fits slidably

The column tube 1 in this embodiment is the tube of a commercially-available syringe. Its volume is for example 50ml. At its upper open end it has a conventional flange 12 with a flat 17 at one side to prevent rolling. The column has the usual uniform cylindrical wall 11, which can conveniently be mounted upright in a laboratory clamp 6. The lower end of the column has an integral convergence 13 to a nozzle 15, in which a metal spigot 16 is incorporated to form an outlet union connectable, e.g by a conventional ferrule, to an outlet pipe if desired.

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A sintered glass filter disc 5 is fixedly mounted across the lower end of the tube 1 at the transition to the convergent portion 13. The tube wall at this portion 14 has been heat deformed and fused with the periphery of the glass sintered disc 5 to form a permanent joint.

The glass column wall 11 is transparent in the usual way.

The plunger 2 is also an all-glass construction, made from standard laboratory glass using standard glass-forming techniques. Its three main components are a central tubular stem 32 defining a flow conduit 3, an outer tubular housing wall 22 surrounding the stem and having a top head 21, and a sintered glass permeable filter disc 4 mounted in the front end of the stem.

The tubular outer wall 22 has a lower portion extending approximately half the length of the plunger, nearly to the front end, which has a machined glass surface 23 making a sliding sealing fit against the inner surface of the column tube wall 11. By this means the plunger 2 defines with the column tube 1 a sealed internal bed space 7 between the upper and lower filter elements 4,5. No resilient seal element is required, although one may be used if desired adjacent to the front end. The elongate close-fitting glass surface 23 also maintains axial alignment of the plunger 2 in the column 1. Above a shoulder 24 at the top of the machined surface 23 the plunger 22 narrows, so that it can be slid as far down as desired inside the column tube 1. A chromatography medium bed of any desired length can therefore be established in the space 7. A laboratory clamp 6' suffices to hold the

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plunger down in contact on top of the medium bed.

The internal tubular stem 32 of the plunger can be made from stock glass tubing e.g of 1mm bore. Using standard glass forming techniques its lower end is flared outwardly to form a divergent section 33 and its periphery is fused onto the upper surface of the glass sinter disc 4. A fused joint is also established between the mouth 25 of the outer glass wall 22 and the periphery of the sinter disc 4, and onto the edge of the divergent portion 33 of the central stem. By exploiting glass' intrinsic propensity for forming and fusing by simple hot manipulations, this provides a plunger end construction which is fully internally sealed (i.e preventing leaks into the space between the stem 32 and outer wall 22) and externally sealed against the column wall 11, without requiring any discrete sealing elements. It is also fully transparent, so that the user can observe the flow of sample through the conduit 3 and down onto the sinter disc 4, verifying the absence of trapped air in the divergent space 35 above the disc 4 - this latter is important, and difficult to check in conventional opaque constructions.

It is in generally desirable to minimise the volume of the distinction space 35 and not difficult to do so in thermoformable material. The same applies to the lower convergence 13 of the column tube.

The surface groove around the outer well behind the joint to the disc will provide a useful seating for a discrete deformable seal element, either additionally to the glass-glass seal illustrated or, in a alternative embodiment, or the sole external seal.

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At its upper end the central tubular stem 32 is bent sideways and emerges through the outer tubular wall 22, below the enlarged head 21. The end of the tube 32 is bonded into this opening by a thermally-fused joint 38, completing the sealing of the fluid flow path in the plunger *vis á vis* the exterior. The upper opening of the tube mouth 37 has a connection union formed with an internal glass thread 36. Alternatively, the tube may project laterally beyond the column wall 22 as a nozzle to house a metal spigot of the kind used at the bottom of the column 1, or some other suitable union may be used.

It will be noted that the head 21 is clear of the union opening 27 so that the plunger can be manipulated without interfering with the fluid connections.

The skilled reader will appreciate that the various integrally-fused bonds created in this embodiment, exploiting the properties of glass, individually provide advantages over prior art constructions. Useful embodiments of our proposals can therefore be made with only some of these integral bonds, and/or using different materials. The double-tube construction shown in Fig 1 may be too elaborate for very small columns, and Fig 2 shows the end of a plunger for a small column, in which a single hollow glass rod provides both the exterior surface 23 and the internal conduit 3 of the plunger. In this very simple structure the divergence at the front end of the conduit is dispensed with and the sinter disc 4 is fused or otherwise bonded directly onto the front face of the tubular rod 39.

Fig 3 shows a similar solid-rod construction, modified by the machining of a divergent chamber 35 immediately

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upstream of the permeable disc 4, and the recessing of the disc 4 into the front face of the rod 39.

In the Fig 2 and Fig 3 constructions the outer surface 23 of the rod effects the seal against the tube wall. Fig 4 shows how additionally or alternatively a deformable seal element such as a rubber O-ring 223 or a PTFE ring may be fitted around the front end of the plunger exterior.

In all of the above embodiments a full cylindrical contact of the plunger in the column tube assures the axial alignment of the two main components. However this is not essential, and particularly in plastics constructions material may be saved by using a construction as in Fig 5. Here a one-piece moulded plastics entity forming the plunger has a central tubular portion 332 defining the internal conduit 3, surrounded by axially-extending fins 222 which provide the necessary axial alignment against the column tube wall, and a solid end unit 250 providing the necessary seal against the tube wall, e.g via PTFE ring 223, and the surrounding fused or bonded join to the permeable filter element 4.

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CLAIMS

1. A chromatography column having a column tube and
end filter arrangements which, in use, retain a bed of
5 particulate chromatography medium in the column tube
between them while allowing the passage of fluid for
chromatography;

at least one of the end filter arrangements being at
the front end of a plunger which is axially slidable along
10 inside the column tube, makes a seal outwardly against the
tube and incorporates an internal flow conduit
communicating along the plunger between a permeable filter
portion of the respective end filter arrangement and a rear
part of the plunger outside the column tube;

15 the plunger comprising a tubular stem of glass or
other formable material which defines in one piece said
internal flow conduit, the permeable filter portion being
integrally bonded to the front end of the tubular stem
across the internal flow conduit.

20 2. A chromatography column according to claim 1 in which
the filter portion is integrally fused to the plunger
stem.

25 3. A chromatography column according to claim 1 or claim
2 in which both stem and filter portion are of glass or
thermoplastics material.

30 4. A chromatography column according to claim 1 in which
the tubular stem extends as a one-piece integral whole back
to a rear connection union at the rear of the plunger.

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5. A chromatography column according to claim 4 in which the rear connection union has a joint boundary at the exterior of the plunger stem.

5 6. A chromatography column according to any one of the preceding claims in which an outwardly-directed sealing portion at or adjacent the front end of the plunger which makes a seal directly against the column wall, or which mounts a deformable seal element for making such a seal, is
10 joined to the permeable filter portion via a one-piece integral instruction.

15 7. A chromatography column according to claim 6 in which the permeable filter portion is bonded to the plunger's outer wall by being integrally fused therewith.

20 8. A chromatography column according to any one of the preceding claims in which the plunger further comprises an outer plunger wall spaced outwardly from said tubular stem defining the internal flow conduit, the outer plunger wall and tubular stem being integrally bonded to one another at the front end of the plunger so as to seal off an internal space of the plunger, around said tubular stem, at the front end.

25 9. A chromatography column according to any one of the preceding claims in which one end of the column tube has a full-diameter opening receiving the plunger and the other end is a closed end, converging to a union for an external
30 fluid flow conduit and having a fixed permeable filter element across the column tube adjacent the closed end.

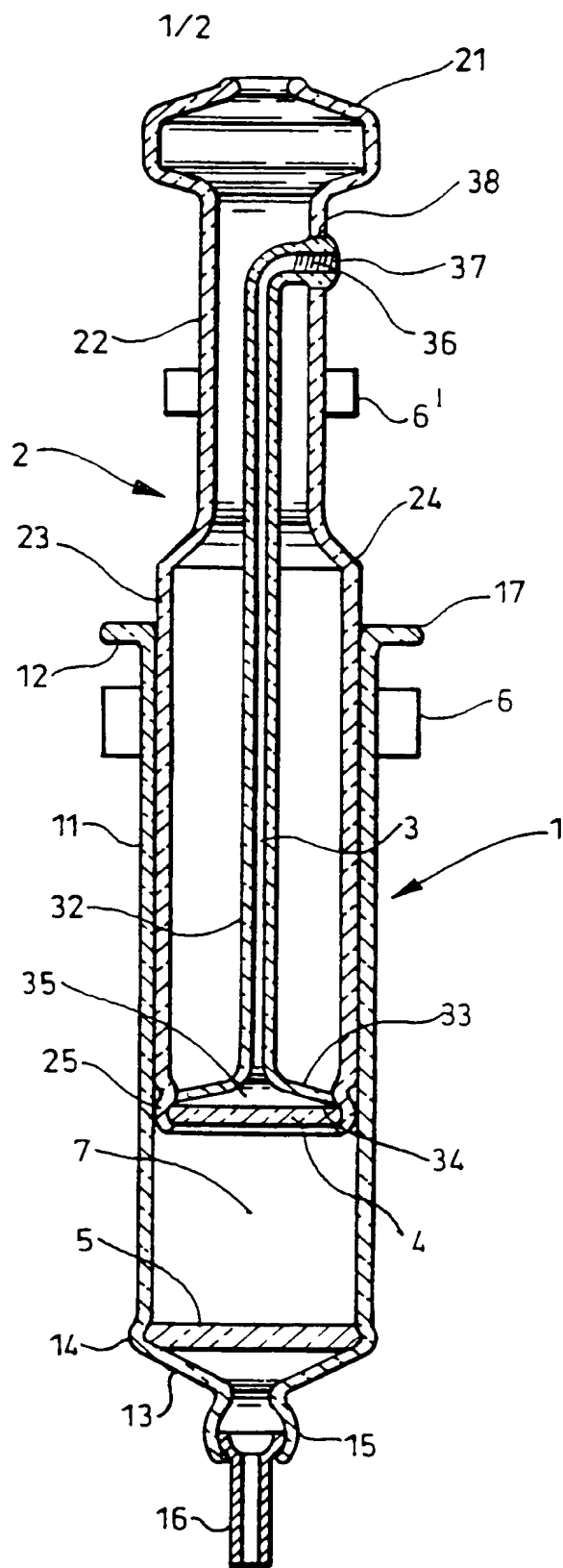


FIG.1.

2/2

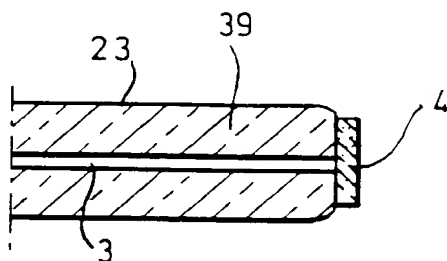


FIG. 2.

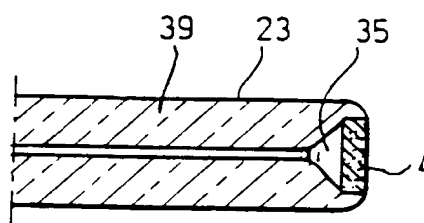


FIG. 3.

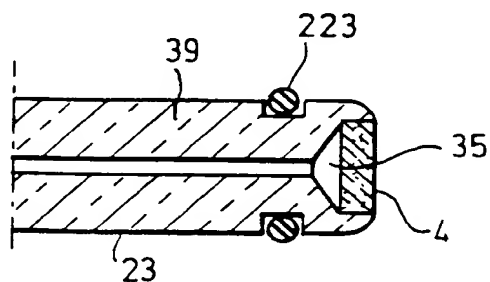


FIG. 4.

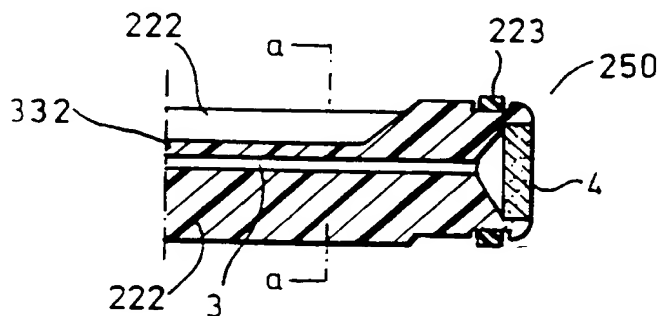


FIG. 5.

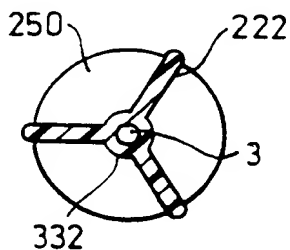


FIG. 5a.

INTERNATIONAL SEARCH REPORT

International Application No.
PCT/GB 00/01937

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 G01N30/60

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 G01N

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

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☒ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

* Special categories of cited documents:

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- "E" earlier document but published on or after the international filing date
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- "O" document referring to an oral disclosure, use, exhibition or other means
- "P" document published prior to the international filing date but later than the priority date claimed

- "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
- "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
- "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
- "&" document member of the same patent family

Date of the actual completion of the international search

17 July 2000

Date of mailing of the international search report

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INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/GB 00/01937

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INTERNATIONAL SEARCH REPORT

Inte Application No

PCT/GB 00/01937

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

| Category * | Citation of document, with indication, where appropriate, of the relevant passages | Relevant to claim No. |
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